MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2015/2016

PTG 0116 – TRIGONOMETRY AND COORDINATE GEOMETRY

(All sections / Groups)

16 OCTOBER 2015
3.00 p.m. - 5.00 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **FIVE** printed pages (including cover page) with **FOUR** questions and an appendix only.

2. Answer **ALL** questions.

3. Write your answers in the Answer Booklet.

Question 1

(a) Without using the calculator, find the exact value of $\cos\left[\cot^{-1}\frac{3}{4}\right]$. [4 marks]

(b) Verify the identity: $\sin(\alpha+\beta)\cos\beta-\cos(\alpha+\beta)\sin\beta=\sin\alpha$. [6 marks]

(c) Solve the trigonometric equation $\sin^2\theta-\cos^2\theta=0$ for $0\le\theta\le 2\pi$. [6 marks]

(d) Solve the triangle in **Figure 1** below. Leave your answer to 2 decimal places.

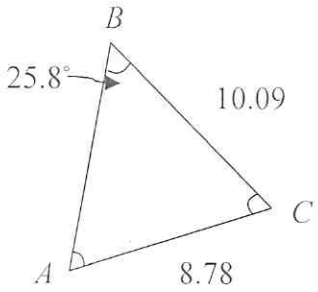

Figure 1

[9 marks]

Question 2

(a) Given $\mathbf{u}=2\mathbf{i}-\mathbf{j}+3\mathbf{k}$, $\mathbf{v}=-\mathbf{i}-3\mathbf{j}$ and $\mathbf{w}=-2\mathbf{i}-6\mathbf{j}+4\mathbf{k}$. Find:

i. $(4\mathbf{v}-\mathbf{w})\times\mathbf{u}$. [6 marks]

ii. Find the acute angle between vector $\mathbf{v}$ and $\mathbf{w}$. [5 marks]

(b) Express the following expression in the standard form $a+bi$.

i. $2i^9+(4-i)^2$. [4 marks]

ii. $\dfrac{(3-2i)(8+3i)}{1+4i}$. [6 marks]

(c) Write $w=6-2i$ in polar form. [4 marks]

Continued...

Question 3

(a) Given two points $A=(-2,-4)$ and $B=(2,1)$. Find:

i. the distance and midpoints of AB. [4 marks]

ii. the equation of straight line CD that is perpendicular to AB and passes through the midpoint of AB. [5 marks]

iii. the equation of straight line EF that is parallel to AB and passes through the origin. [3 marks]

(b) Given the equation of an ellipse is $\frac{(x-4)^2}{64}+\frac{(y+2)^2}{36}=1$.

i. Find the coordinates of the center, foci and vertices of the ellipse.

[9 marks]

ii. Sketch the ellipse and label the center, foci and vertices. [4 marks]

Question 4

(a) Given that $A=\begin{bmatrix}4 & 2 & 0\\ 1 & 3 & -1\\ 0 & 1 & 0\end{bmatrix}$ and $B=\begin{bmatrix}1 & 2 & 1\\ 0 & 3 & 2\\ 0 & x & -3\end{bmatrix}$.

i. Determine the value of x if $|B|=2$. [5 marks]

ii. By using the value of x in (a) (i), express A^T+2B as a single matrix.

[4 marks]

Continued...

(b) A is the matrix $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 0 & 3 \\ -1 & 4 & 0 \end{bmatrix}$.

i. Find $|A|$ and show that the matrix cofactors of A is $\begin{bmatrix} -12 & -3 & 4 \\ 4 & 1 & -10 \\ 6 & -5 & -2 \end{bmatrix}$. [8 marks]

ii. Deduce the inverse of matrix A as a single matrix. [4 marks]

iii. Find the unique solution for the following system of linear equations.

$$2x + 2y + z = 1$$
$$x + 3z = 2$$
$$-x + 4y = -2$$

[4 marks]

End of Paper

APPENDIX
Trigonometric identities and formulas

$\cos^2 A + \sin^2 A = 1$ $\quad \sec^2 A = 1 + \tan^2 A$ $\quad \csc^2 A = 1 + \cot^2 A$

$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$ $\quad \cos 2A = 2\cos^2 A - 1 = 1 - 2\sin^2 A = \cos^2 A - \sin^2 A$

$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$ ... $\sin 2A = 2\sin A \cos A$

$\tan(A \pm B) = \dfrac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$ .... $\tan 2A = \dfrac{2\tan A}{1 - \tan^2 A}$

$2\sin A \cos B = \sin(A + B) + \sin(A - B)$

$2\cos A \cos B = \cos(A + B) + \cos(A - B)$

$2\sin A \sin B = \cos(A - B) - \cos(A + B)$

$\sin A + \sin B = 2\sin\dfrac{A+B}{2}\cos\dfrac{A-B}{2}$ .... $\sin A - \sin B = 2\cos\dfrac{A+B}{2}\sin\dfrac{A-B}{2}$

$\cos A + \cos B = 2\cos\dfrac{A+B}{2}\cos\dfrac{A-B}{2}$ $\quad \cos A - \cos B = -2\sin\dfrac{A+B}{2}\sin\dfrac{A-B}{2}$

$\sin^2\dfrac{A}{2} = \dfrac{1-\cos A}{2}$ $\quad \cos^2\dfrac{A}{2} = \dfrac{1+\cos A}{2}$ $\quad \tan^2\dfrac{A}{2} = \dfrac{1-\cos A}{1+\cos A}$

$\sin\dfrac{A}{2} = \pm\sqrt{\dfrac{1-\cos A}{2}}$ $\quad \cos\dfrac{A}{2} = \pm\sqrt{\dfrac{1+\cos A}{2}}$ $\quad \tan\dfrac{A}{2} = \pm\sqrt{\dfrac{1-\cos A}{1+\cos A}} = \dfrac{1-\cos A}{\sin A} = \dfrac{\sin A}{1+\cos A}$